



# ICTV Virus Taxonomy Profile: *Peribunyaviridae*

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## Abstract

Peribunyaviruses are enveloped and possess three distinct, single-stranded, negative-sense RNA segments comprising 11.2–12.5 kb in total. The family includes globally distributed viruses in the genera *Orthobunyavirus*, *Herbivirus*, *Pacuvirus* and *Shangavirus*. Most viruses are maintained in geographically-restricted vertebrate–arthropod transmission cycles that can include transovarial transmission from arthropod dam to offspring. Others are arthropod-specific. Arthropods can be persistently infected. Human infection occurs through blood feeding by an infected vector arthropod. Infections can result in a diversity of human and veterinary clinical outcomes in a strain-specific manner. Segment reassortment is evident between some peribunyaviruses. This is a summary of the International Committee on Taxonomy of Viruses (ICTV) Report on the taxonomy of the family *Peribunyaviridae*, which is available at [ictv.global/report/peribunyaviridae](http://ictv.global/report/peribunyaviridae).

**Table 1.** Characteristics of members of the family *Peribunyaviridae*

Typical member	Bunyamwera virus (S, D00353; M, M11852; L, X14383), species <i>Bunyamwera orthobunyavirus</i> , genus <i>Orthobunyavirus</i>
Virion	Enveloped, spherical or pleomorphic virions, 80–120 nm in diameter
Genome	Three single-stranded, negative-sense RNA molecules, S, M and L, each of about 1, 4 and 6.8 kb
Replication	Cytoplasmic; primary transcription is primed by ‘cap snatching’ of host RNAs
Translation	On ER-bound ribosomes for Gn and Gc and on free ribosomes in the cytoplasm for N and L
Host range	Vertebrates and invertebrates (including mammals, birds, mosquitoes, culicoids and psychodid sandflies)
Taxonomy	Phylum <i>Negarnaviricota</i> , subphylum <i>Polyploviricotina</i> , class <i>Ellioviricetes</i> , order <i>Bunyavirales</i> , several genera and >90 species

## VIRION

Peribunyavirus virions are spherical or pleomorphic, 80–120 nm in diameter [1] with glycoprotein surface projections (5–18 nm) embedded in a lipid bilayer envelope (about 5 nm) (Table 1, Fig. 1). The genome comprises three single-stranded negative-sense RNAs (designated S, small, M, medium and L, large) (Fig. 2), each with complementary terminal nucleotide sequences that base-pair to form non-covalently closed, circular RNAs [2] that are individually encapsidated.

## GENOME

The S segment encodes the nucleocapsid protein (N), which is abundant in infected cells; in some viruses an overlapping reading frame encodes the non-structural protein NSs [3–5]. The M segment encodes two structural glycoproteins (Gn and Gc). Some members also encode a non-structural protein (NSm) between the Gn and Gc coding regions [4]. The L segment encodes the L protein, which has RNA-directed RNA polymerase and endonuclease functions.

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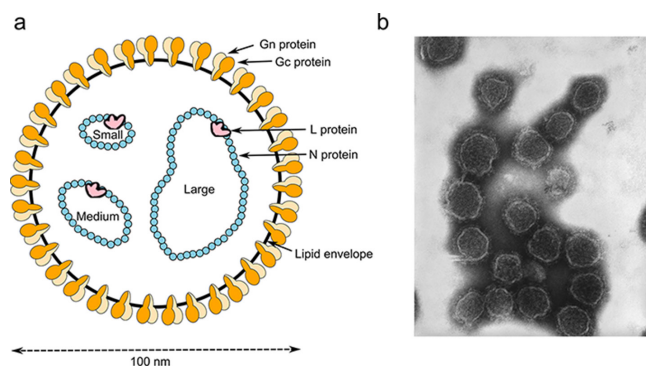
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**Keywords:** *Peribunyaviridae*; bunyavirus; ICTV Report; *Orthobunyavirus*; *Herbivirus*; *Pacuvirus*; *Shangavirus*; taxonomy.

**Abbreviations:** G, Glycoprotein; L, N and NS, large, nucleocapsid and non-structural proteins; S, M and L, Small, medium and large vRNA segments. 001365

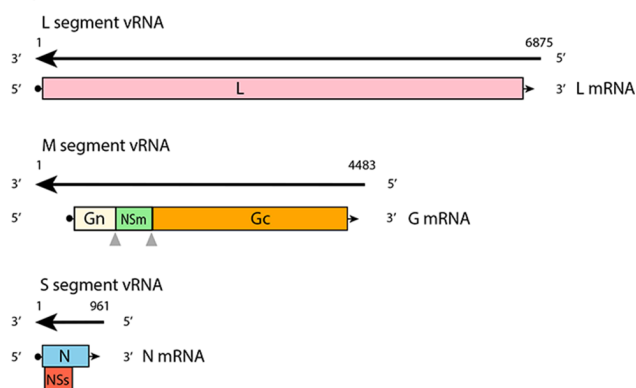


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**Fig. 1.** Peribunyavirus virion structure. (a) representation of a virion in cross-section. The surface spikes comprise the Gn and Gc glycoproteins. The helical nucleocapsids are circular and comprise one each of the unique ssRNA segments (L, large; M, medium; S, small) encapsidated by N protein and associated with the L protein. (b) negative-stained transmission electron microscopy photograph of California encephalitis virus virions (image: CDC/Drs Frederick Murphy and Erskine Palmer).

#### Bunyamwera virus



**Fig. 2.** Coding strategy of Bunyamwera virus. Translation of NSs protein is initiated at an alternative start codon. The Gn, NSm and Gc proteins are generated by co-translational cleavage of M polyprotein.

## REPLICATION

Virions attach via surface glycoproteins, entering the cell through clathrin-mediated endocytosis. Fusion of the viral Gc protein fusion peptide with endosomal membranes facilitates the release of ribonucleocapsids into the cytoplasm. The complementary 5'- and 3'-terminal ends serve as promoters for both mRNA and antigenome synthesis. Viral mRNAs are not polyadenylated and are truncated relative to the vRNA; a 5'-methylated cap is derived from host mRNA via 'cap snatching' mediated by the endonuclease function of the L protein. Proteins are translated on free ribosomes (S and L segment mRNAs) or membrane-bound ribosomes (M segment mRNA). The Gn and Gc proteins are generated by co-translational cleavage and targeted to and retained in the Golgi complex. Ribonucleoproteins are targeted

near the Golgi complex. Genomes are packaged by signals from non-conserved sequences in the terminal untranslated regions. Virions bud into Golgi cisternae and are transported to the cell surface by the secretory pathway [6].

## TAXONOMY

Genera are monophyletic based on analysis of the virus L protein; members of a genus have similar genomic organizations and transmission cycles. Peribunyaviruses form a group in the phylum *Negarnaviricota*, subphylum *Polyploviricotina*, class *Ellioviricetes*, order *Bunyavirales*, being most closely related to viruses of the families *Fimoviridae* and *Tospoviridae*. Peribunyaviruses share some of the following characteristics: (i) enveloped spherical or pleomorphic virions; (ii) three segments of single-stranded, negative-sense RNA, with all proteins encoded in the same sense; (iii) capped but not polyadenylated viral mRNA; (iv) establish a persistent infection in an arthropod vector.

## RESOURCES

Current ICTV Report on the family *Peribunyaviridae*: [ictv.global/report/peribunyaviridae](http://ictv.global/report/peribunyaviridae).

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#### Conflicts of interest

The authors declare that there are no conflicts of interest.

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